CARDIOLOGY Rounds®

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Universal Healthcare: Equal for all? Socioeconomic Differences in Post-myocardial Infarction Care and Outcomes in Canada

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"Canadians strongly support the core values on which our healthcare system is premised – equity, fairness and solidarity.... These values are tied to their understanding of citizenship. Canadians consider equal and timely access ... on the basis of need as a right of citizenship, not a privilege of status or wealth.... Medicare is a worthy national achievement, a defining aspect of our citizenship and an expression of social cohesion."

In November 2002, Roy Romonov gave the above description in the Commission on the Future of Health Care in Canada. Medicare, Canada's universal health system, provides comprehensive coverage for both hospital and outpatient services. It is unique among industrialized countries in that it bans any parallel private insurance of services. This is embodied in the Canada Health Act, passed by the federal government in 1984. Core tenets of the Act include the principles of universality and accessibility, that coverage must be on uniform terms and conditions, and that reasonable access to health services must be unimpeded by financial or other barriers.[3] This issue of *Cardiology Rounds* reviews socioeconomic disparities in access to cardiac care and outcomes; specifically, it will examine whether universal healthcare has been successful in alleviating any such inequalities in Canada.

Differences in health outcomes across income and education levels have long been recognized and studies have consistently shown an inverse and stepwise relationship between socioeconomic class and premature death.[4] Data from 1972 to 1989 reveal that, in the United States, people earning <$15,000. per year were 3 times more likely to die prematurely than people earning >$70,000. per year.[5]

Healthcare in the United States is predominantly provided by private insurance. Government insurance exists for the elderly and the poor in the form of Medicare and Medicaid, respectively, and these provide approximately 14% of healthcare coverage in the United States. However, an estimated 44 million American individuals fall outside of these programs and lack health insurance. As such, a great deal of attention has been given to racial, ethnic, and socioeconomic differences in heathcare in the United States.[5] Specifically, in terms of cardiovascular health, there have been reports of significant differences in access to angiography, medication use, specialist care, and outcomes across different ethnic groups and socioeconomic classes.[8-12] However, these differences cannot be accounted for solely on the basis of different forms of insurance coverage. Elderly patients are entitled to universal hospital care coverage through Medicare. Nonetheless, data from 132,130 elderly Medicare beneficiaries hospitalized for acute myocardial infarction (MI) between 1994 and 1996 – when divided into low-, medium-, and high-income groups by median neighbourhood incomes – revealed a lower adjusted 30-day and 1-year mortality in the highest income group.[13] Patients with a median income of >$44,647. had

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a relative risk of 0.89 [95% confidence interval (CI), 0.85-0.94] for 30-day mortality and 0.92 (95% CI, 0.88-0.97) for 1-year mortality.

Universal healthcare: Achievements and short-falls

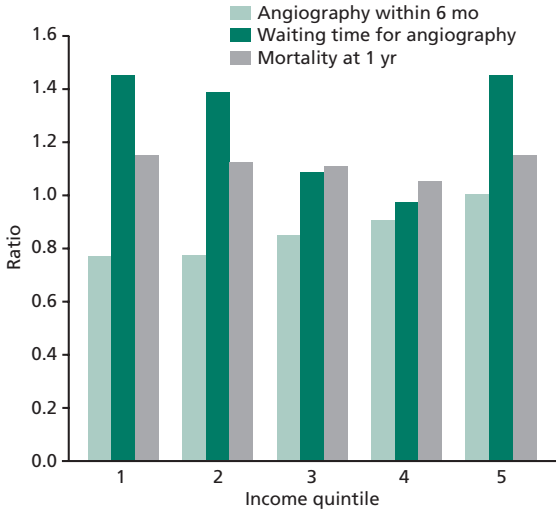
Universal healthcare, in which publicly funded, comprehensive in-hospital and outpatient care is provided, has been suggested as a method to improve access to healthcare for the uninsured population and, thereby, reduce these disparities in health outcomes. Prior to universal healthcare, it was estimated that almost one-half of Canadians had either limited or no medical coverage, especially the poor and those in rural communities. In the time since the Canada Health Act was enacted, there have been considerable improvements in access to medical services for poorer Canadians.[14] Nevertheless, those of a lower socioeconomic status remain less likely to receive specific services. Katz et al examined the association between income and education and the rates of breast and cervical cancer screening in Ontario and the United States. They found that the use of cancer screening procedures was similar in both countries and a significant inequality existed between different socioeconomic strata. When rates of colorectal cancer screening in Ontario were examined, a similar inequality was seen.

Cardiac care in Canada

Pilote et al examined access to cardiac procedures after a first MI in Quebec between 1985 and 1995. Data on socioeconomic status was obtained from census data on neighbourhood median incomes by linking postal codes, an accepted and validated surrogate for personal income.[7] Data on 62,364 individuals were examined:[7] 33% of male patients in low socioeconomic areas (median family income <$30,809) underwent cardiac catheterization in comparison to 47% of male patients in high socioeconomic areas (median family income $92,169).[7] Similar differences were observed for female patients.[7] In contrast, among those who received cardiac catheterization, the rates of coronary revascularization by either coronary artery bypass graft (CABG) surgery or percutaneous coronary intervention (PCI) were similar, regardless of income.[7]

Alter et al examined similar types of data from Ontario concerning 51,591 patients admitted to hospitals with an acute MI between April 1994 and March 1997. Incomes were determined by the median incomes of their residential neighborhoods, based on census data. Endpoints in the study included the use of coronary angiography and revascularization, in addition to 1-year mortality.[18] There was a significant 23% increase in the rates of angiography between the lowest and highest quintile of income.[18]

Figure 1: Adjusted relative rates of angiography within 6 months post-acute MI, waiting times for angiography, and 1-year mortality according to income quintile. Results have been standardized for age, sex, and type of on-site facilities for cardiac procedures. The patients in the highest quintile served as the reference group. The bars show the relative differences in adjusted rates and waiting times. P for trend <0.001 for each of the 3 outcome variables.[18]



Similarly, there was a 9.2 day longer adjusted waiting time for angiography and a 3.1% increase in 1-year mortality between these groups, all of which were statistically significant (Figure 1).[18]

The authors performed a multivariate analysis, in which the patient's age, sex, severity of disease, specialty of the attending physician, the characteristics of the admitting hospital (teaching status and presence of on-site facilities for cardiac procedures), and the geographic proximity of the admitting hospital to a tertiary care centre, were all controlled for.[18] They found that for each $10,000 increase in income, there was an associated 17% increase in angiography at 6 months (adjusted hazard ratio, 1.17; 95% CI, 1.12 -1.22) and a 10% reduction in death at 1 year (adjusted hazard ratio, 0.90; 95% CI, 0.86 - 0.94).[18]

Potential limitations of these studies are that they are retrospective and, specifically, that the use of linked administrative databases limit the ability to characterize the patients in the cohort.[18] Hence, important baseline characteristics or clinical variables may not be accounted for in the multivariate analysis. Thus, one can argue that the differences in health service utilization and outcomes observed in these studies are derived from the clinical differences that exist between the socioeconomic groups and, therefore, are not necessarily inappropriate.

The Socio-Economic Status and Acute Myocardial Infarction study (SESAMI) is an ongoing prospective, longitudinal, observational study of patients hospitalized with acute MI in Ontario.[2] This study analyzed 2256 patients in 53 of the 57 high-volume Ontario hospitals during the period between December 1, 1999 to June 1, 2002.[2] Patients completed a questionnaire addressing risk factors for atherosclerosis and socioeconomic status.[2] Follow-up phone interviews were conducted at 30 days addressing functional status, quality of life, use of specialized cardiac services, as well as medication use.[2]

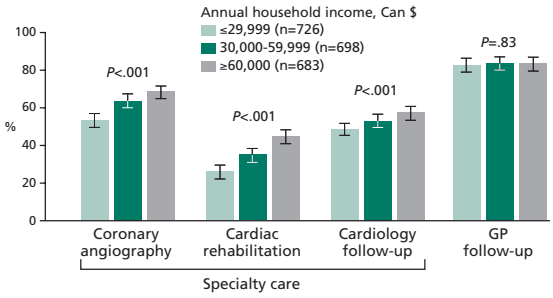
While most patients who received interventions did so during their index hospitalization, regardless of socioeconomic status, there was a significant socioeconomic gradient in the post-discharge rates of referral for coronary angiography, for cardiac rehabilitation, and for cardiology assessment (Figure 2).[2] Crude mortality rates between 30 days and 1 year were 5.1% among patients with lower household incomes (<$29,999.) compared to 1.9% for higher income patients (>$60,000.) (p=0.001).[2] A similar trend was seen in crude mortality in patients with incomplete high school education versus those with a completed post-secondary degree (4.4% versus 2.9% p=0.07).[2]

These 3 studies demonstrate a persistent income-related difference in the rates of use of specific services and outcomes despite the universal health coverage that exists in Canada. These are consistent with findings of other studies conducted in countries with similar levels of universally available healthcare. For example, the FINMONICA MI registry in Finland revealed that low-income patients had significantly higher risks of pre-hospital, 28-day, and 1-year death after an MI, compared to higher-income patients. A Scottish population-based study found that increasing socioeconomic deprivation was associated with increased preadmission, in-hospital, and 30-day mortality after an MI. The persistence of these disparities – despite universal health coverage – suggests that disparities in post-MI outcomes cannot be accounted for solely on the basis of differences in availability of resources.

Potential determinants of the socioeconomic gradient in care

The issues of service supply and geography as possible determinants for the socioeconomic gradient in care was examined by multivariate hierarchical logistical regression modeling on data from 47,036 patients with acute MI admitted to hospitals in Ontario.[22] After adjusting for baseline patient and physician factors, the authors examined the interactions between hospital and regional characteristics, socioeconomic status, and angiography use. They found that hospitals with on-site angiography capacities,

Figure 2: Provision of care according to personal income. P values are for trend. Error bar includes the 95% CI.[2]

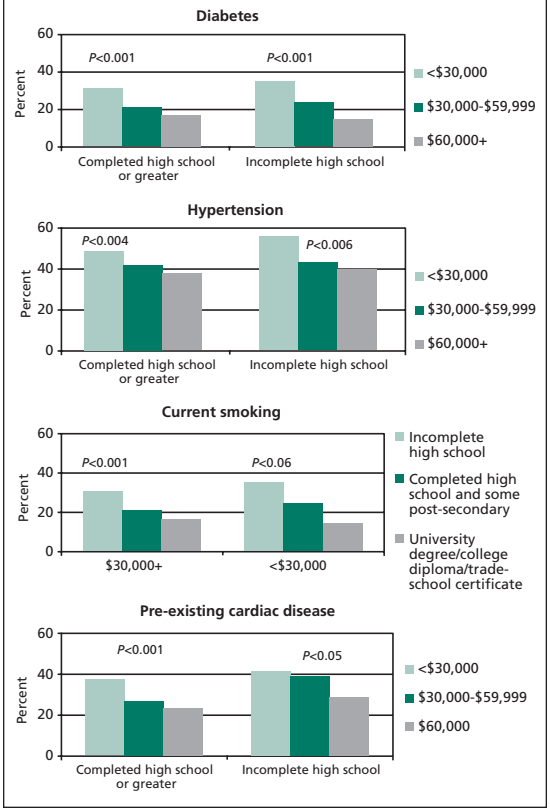


those with university affiliations, and those closest to tertiary care centres all had higher angiography rates.[22] Nonetheless, within each hospital and geographic subgroup, the rates of angiography rose progressively with increases in neighbourhood income.[22] The impact of socioeconomic status on angiography use was similar, regardless of on-site procedural capacity, affiliation to a university, proximity to a tertiary care centre, or whether it was a rural or urban setting.[22]

Implicit in universal health coverage is that utilization of resources is based on medical need. Finkelstein compared healthcare expenditure in 2170 patients in Ontario to self-reported health status and income. He found that after adjustment for health status, there was no association between income and the health expenditures on all physician services, out-of-hospital services, or specialist care. Thus, he concluded that healthcare utilization was, in fact, based predominantly on need. However, a survey of healthcare provider experiences and perceptions of preferential access to cardiac care in Ontario revealed that the majority of providers acknowledged being involved in the care of patients who have received treatment on the basis of factors other than medical need. Furthermore, Finkelstein's conclusion, if it is consistent with the findings of studies on post-MI care in Ontario, would imply that patients of lower socioeconomic status are, in general, of a lower risk category. However, the bulk of evidence would suggest that people in upper classes have healthier lifestyles and behaviours.[5]

In Great Britain, the percentage of smokers in the upper class dropped from 42% in 1973 to 17% in 1996, even as the rate of smoking rose from 75% to 80% among people in the lowest class.[5] In the United States, people without a high school diploma, when compared with college graduates, are 3 times as likely to smoke and are nearly 3 times more likely to neglect leisure-time physical exercise.[5] The influence of education and income on cardiac risk factors was examined in the cohort of 3334

Figure 3: The prevalence of diabetes, hypertension, smoking and pre-existing heart disease stratified according to income and education among patients <65 years old who were hospitalized with acute MI in Ontario.[25]



patients, hospitalized with an MI in the SESAMI study. This analysis demonstrated that the prevalence of diabetes, hypertension, smoking, and pre-existing heart disease was higher among the poor and less educated (Figure 3).[24] Moreover, after adjusting for baseline differences in age, sex, ethno-racial factors, and geography, both income and education were independently associated with atherogenic risk factors.[24]

The distribution of traditional cardiovascular risk factors across income levels contributes significantly to the socioeconomic gradient in cardiovascular care and outcomes. For example, the differences in mortality seen in the SESAMI trial across socioeconomic groups were no longer evident when adjusted for baseline characteristics. However, other data would suggest that differences in risk factors cannot account for the entire inequality in mortality.[2] Vartiainen et al derived predicted changes in mortality from ischemic heart disease in Finland over a 20-year period, using logistic regression models with the risk factor levels assessed by conducting annual cross-sectional population surveys. They compared these predicted values to the actual changes in mortality rates in white and blue collar workers and farmers. Their analysis of 33,130 patients predicted a decline in mortality of 28%, 30%, and 41% among white collar workers, blue collar workers, and farmers, respectively, due to improvements in risk factor profiles. The actual decline in cardiovascular mortality was 61%, 40%, and 37%, respectively, a much greater change than could be accounted for by differences in risk factors alone. Thus, the authors concluded that changes in risk factors alone do not explain the increasing disparity in ischemic heart disease mortality between socioeconomic groups.

Other potential determinants of the socioeconomic gradient in outcome include the use of evidence-based secondary prevention therapies. Multiple studies have shown that angiography and subsequent revascularization rates are different between socioeconomic groups. The extent to which these different rates contribute to differences in cardiac outcomes across income groups has not been studied. Given the substantial evidence that an aggressive and invasive treatment approach to high- and intermediate-risk MI has clinical benefit over a more conservative approach, one would expect that this disparity in invasive procedures would translate into a clinical difference in outcome. However, the magnitude of this difference will be minimized by the fact that the majority of angiography and revascularization appears to occur during the index hospitalization, when socioeconomic disparities are less evident.[2]

Above and beyond invasive cardiac procedures, there are differences among income groups in the use of effective pharmacologic therapies for post-MI care. A multivariate regression analysis of 169,069 Medicare beneficiaries in the United States, found that poor patients were less likely to receive aspirin on admission, with a relative risk of 0.97 (95% CI, 0.96-0.98).[27] Furthermore, they were less likely to receive either aspirin (relative risk 0.98; 95% CI, 0.96-1.00) or ß-blockers (relative risk of 0.95; 95% CI, 0.91-0.99) on discharge. Rao et al found similar differences in the rates of ß-blocker use during the index hospitalization across lower, medium, and high-income groups in his analysis of 132,130 Medicare patients.[13] Given that universal healthcare does not cover prescription costs for the majority of Canadians, one would expect a similar pattern in the use of these therapies in Canada. However, there are no data to evaluate this. Moreover, potential differences in the rates of medication use beyond the

index hospitalization (ie, during follow-up) have not been analyzed, nor has their contribution to the socioeconomic gradient in outcome.

Conclusion

Despite the availability of universal healthcare in Canada, there remains a significant difference between the utilization of cardiac invasive procedures and mortality across socioeconomic strata. The potential determinants of the inequalities in cardiac care are complex and likely multifactorial. Although there is some geographic variability in access to cardiac invasive care, this does not solely account for the differences and neither do differences in cardiac risk profiles, although this is one of the key determinants of the socioeconomic gradient in mortality. Preferential treatment by physicians may also play a role, the magnitude of which is unclear. Furthermore, the use of evidence-based therapies, both invasive and pharmaceutical, are different among different income and education levels. The impact of this difference is also unclear and warrants further study.

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Abstracts of Interest

Effects of socioeconomic status on access to invasive cardiac procedures and on mortality after acute myocardial infarction.

ALTER DA, NAYLOR CD, AUSTIN P, TU JV. TORONTO, ONTARIO

BACKGROUND: Universal healthcare systems seek to ensure access to care on the basis of need rather than income and to improve the health status of all citizens. We examined the performance of the Canadian health system with respect to these goals in the province of Ontario by assessing the effects of neighborhood income on access to invasive cardiac procedures and on mortality one year after acute myocardial infarction. METHODS: We linked claims for payment for physicians' services, hospital-discharge abstracts, and vital-status data for all patients with acute myocardial infarction who were admitted to

hospitals in Ontario between April 1994 and March 1997. Patients' income levels were imputed from the median incomes of their residential neighborhoods as determined in Canada's 1996 census. We determined rates of use and waiting times for coronary angiography and revascularization procedures after the index admission for acute myocardial infarction and determined death rates at one year. In multivariate analyses, we controlled for the patient's age, sex, and severity of disease; the specialty of the attending physician; the volume of cases, teaching status, and on-site facilities for cardiac procedures at the admitting hospital; and the geographic proximity of the admitting hospital to tertiary care centers.

RESULTS: The study cohort consisted of 51,591 patients. With respect to coronary angiography, increases in neighborhood income from the lowest to the highest quintile were associated with a 23 percent increase in rates of use and a 45 percent decrease in waiting times. There was a strong inverse relation between income and mortality at one year (P<0.001). Each $10,000 increase in the neighborhood median income was associated with a 10 percent reduction in the risk of death within one year (adjusted hazard ratio, 0.90; 95 percent confidence interval, 0.86 to 0.94).

CONCLUSIONS: In the province of Ontario, despite Canada's universal healthcare system, socioeconomic status had pronounced effects on access to specialized cardiac services as well as on mortality one year after acute myocardial infarction.

N Engl J Med 1999;341:1359-67.

Socioeconomic Status, Service Patterns, and Perceptions of Care among Survivors of Acute Myocardial Infarction in Canada

ALTER DA, IRON K, AUSTIN PC, NAYLOR D FOR THE SESAMI STUDY GROUP. TORONTO, ONTARIO

CONTEXT: Some have argued that Canada's uniquely restrictive approach to private health insurance keeps the socioeconomic elite inside the public system so that their demands and influence elevate the standard of service for all Canadian citizens. The extent to which this theory is a valid representation of Canadian healthcare is unknown.

OBJECTIVES: To explore how patients with acute myocardial infarction from different socioeconomic backgrounds perceive their care in Canada's universal healthcare system and to correlate patients' backgrounds and perceptions with actual care received.

DESIGN, SETTING, AND PATIENTS: Prospective observational cohort study with follow-up telephone interviews of 2256 patients 30 days following acute myocardial infarction discharged from 53 hospitals across Ontario, Canada, between December 1999 and June 2002.

MAIN OUTCOME MEASURES: Postdischarge use of cardiac specialty services; satisfaction with care; willingness to pay directly for faster service or more choice; and mortality according to income and education, adjusted for age, sex, ethnicity, clinical factors, onsite angiography capacity at the admitting hospital, and rural-urban residence.

RESULTS: Compared with patients in lower socioeconomic strata, more affluent or better educated patients were more likely to undergo coronary angiography (67.8% vs 52.8%; P<.001), receive cardiac rehabilitation (43.9% vs 25.6%; P<.001), or be followed up by a cardiologist (56.7% vs 47.8%; P<.001). Socioeconomic differences in cardiac care persisted after adjustment for confounders. Despite receiving more specialized services, patients with higher socioeconomic status were more likely to be dissatisfied with their access to specialty care (adjusted RR, 2.02; 95% confidence interval, 1.20-3.32) and to favor out-of-pocket payments for quicker access to a wider selection of treatment options (30% vs 15% for patients with household incomes of Can $60000 or higher vs less than Can $30000, respectively; P<.001). After adjusting for baseline characteristics, socioeconomic status was not significantly associated with mortality at 1 year following hospitalization for myocardial infarction.

CONCLUSIONS: Compared with those with lower incomes or less education, upper middle-class Canadians gain preferential access to services within the publicly funded healthcare system yet remain more likely to favor supplemental coverage or direct purchase of services.

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